

EXHIBIT A

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United States Patent [19]

Kittelsen et al.

[11] Patent Number: **5,339,832**[45] Date of Patent: **Aug. 23, 1994**[54] **THERMOPLASTIC MOUTHGUARD WITH INTEGRAL SHOCK ABSORBING FRAMEWORK**[75] Inventors: **Jon D. Kittelsen, Fridley; Paul C. Belvedere, Edina, both of Minn.**[73] Assignee: **E-Z Gard Industries, Inc., Minneapolis, Minn.**[21] Appl. No.: **66,469**[22] Filed: **May 24, 1993**[51] Int. Cl. ⁵ **A61F 5/14**[52] U.S. Cl. **128/862; 128/861; 128/859**[58] Field of Search **128/862, 861, 859**[56] **References Cited**

U.S. PATENT DOCUMENTS

2,630,117	3/1953	Coleman	128/136
2,678,043	5/1954	Stark	128/861
2,702,032	2/1955	Freedland	128/861
3,223,085	12/1965	Gores et al.	128/136
3,247,844	4/1966	Berghash	128/136
3,411,501	11/1968	Greenberg	128/136
3,485,242	12/1969	Greenberg	128/136
3,496,936	2/1970	Gores	128/136
3,505,995	4/1970	Greenberg	128/862
3,513,838	5/1970	Foderick et al.	128/136
3,692,025	9/1972	Greenberg	128/136
3,864,832	2/1975	Carlson	32/40 B
3,943,924	3/1976	Kallestad et al.	128/136

4,337,765	7/1982	Zimmerman	128/136
4,672,959	6/1987	May et al.	128/136
4,765,324	8/1988	Lake, Jr.	128/861
5,152,301	10/1992	Kittelsen et al.	128/861
5,235,991	8/1993	Minneman	128/859

OTHER PUBLICATIONS

American Dental Association. "Give Your Teeth A Sporting Chance," 1985.

Stephen D. Smith, D. M. D. "Muscular Strength Correlated To Jaw Posture and the Temporomandibular Joint." *NYS Dental Journal*. Aug.-Sep. 1978.W. B. May, D.D.S. "Reduction of Stress in the Chewing Mechanism Part III." *Basal Facts*. vol. 3, No. 1.

Primary Examiner—Robert A. Hafer

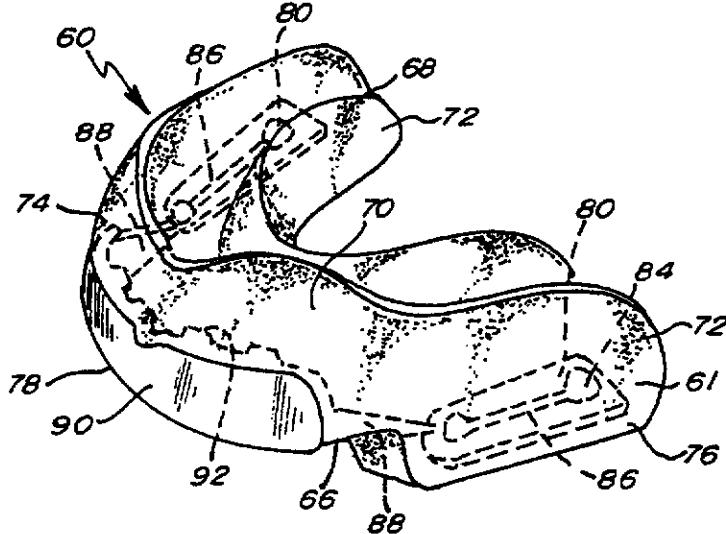
Assistant Examiner—Michael O'Neill

Attorney, Agent, or Firm—Palmatier, Sjoquist & Helget

[57] **ABSTRACT**

A composite mouthguard has a flexible and tough, softenable thermoplastic mouthguard portion with a U-shaped base having upward inner lingual and outer labial walls extending from the base. A shock absorbing and attenuating nonsoftening, resilient, low compression, elastomer framework is embedded in the mouthguard portion to absorb, attenuate and dissipate shock forces exerted on the mouthguard during athletic activity.

23 Claims, 3 Drawing Sheets

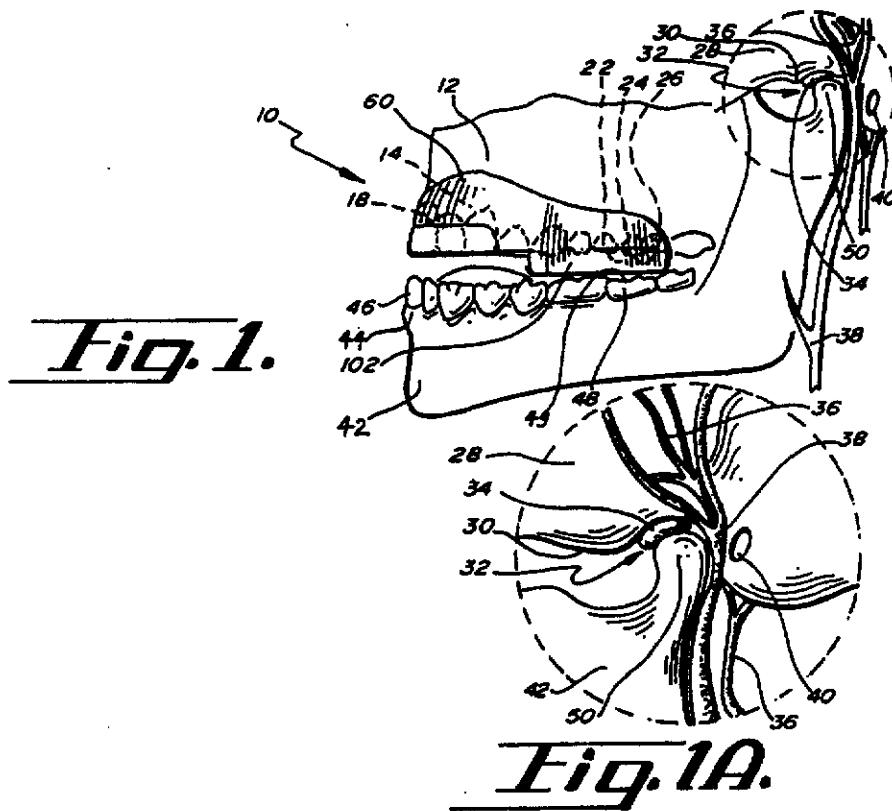


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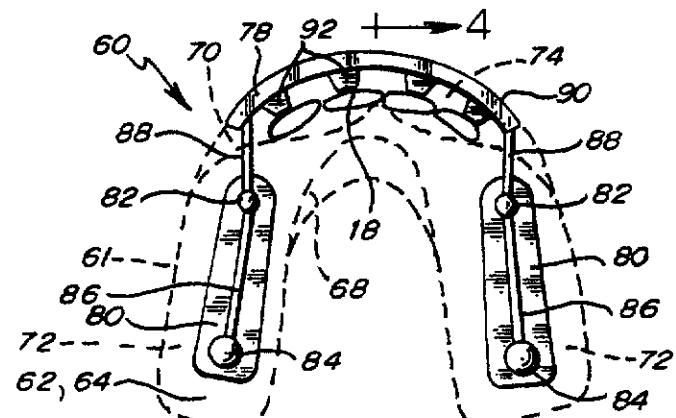


Fig. 2. → 4

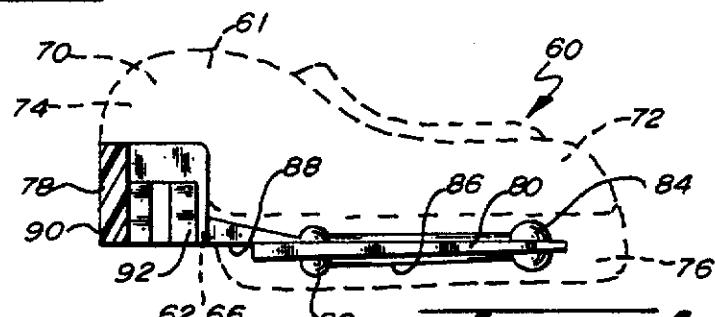


Fig. 4.

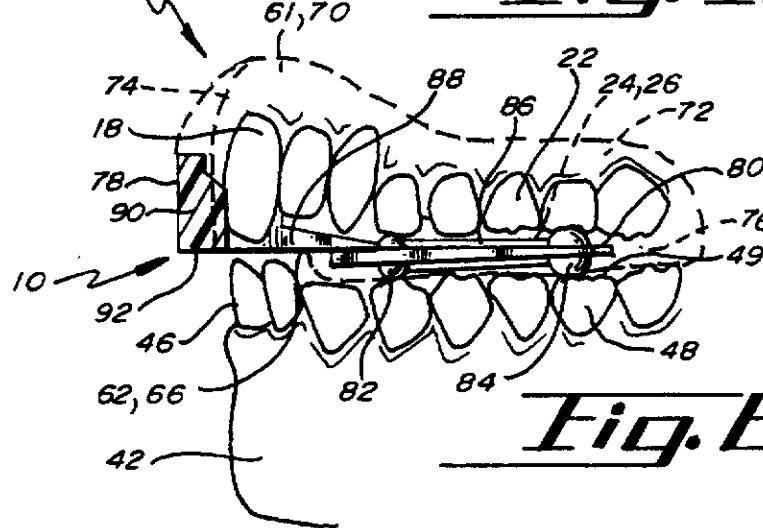


Fig. B.

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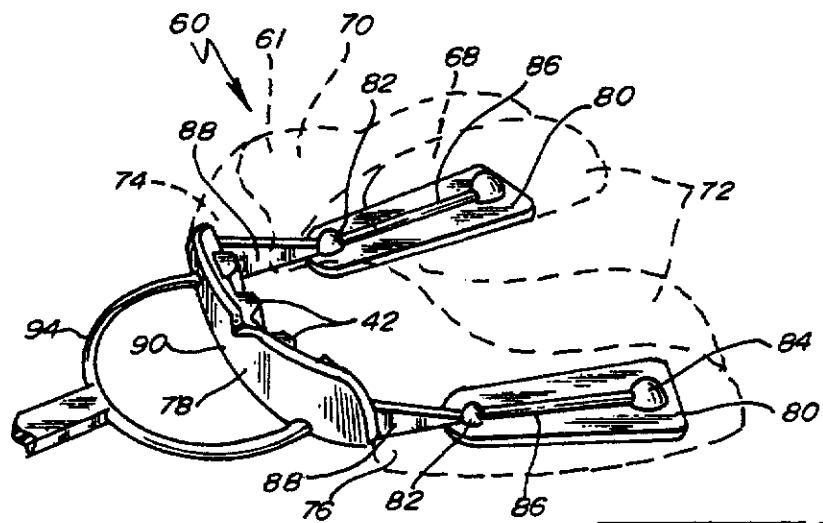


Fig. 3.

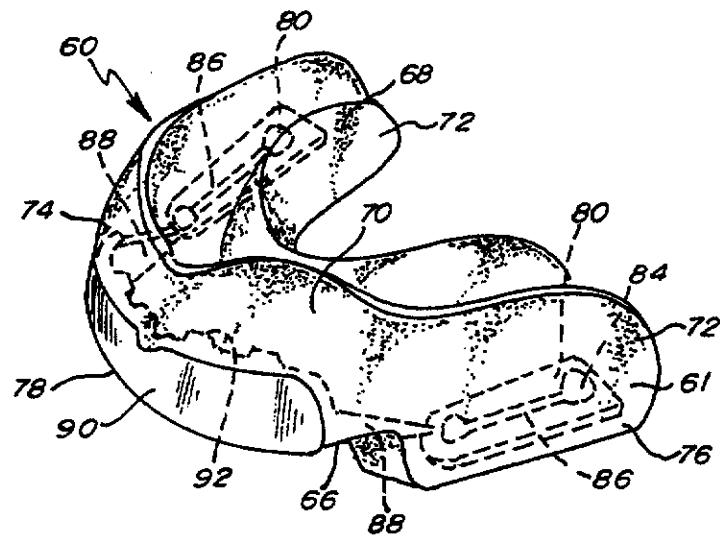


Fig. 5.

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**THERMOPLASTIC MOUTHGUARD WITH
INTEGRAL SHOCK ABSORBING FRAMEWORK**

BACKGROUND OF THE INVENTION

This invention relates generally to a protective mouthguard for use by athletes, and more particularly to a composite mouthguard that absorbs, attenuates and dissipates shock forces exerted on the mouthguard with additional teeth, jaw and joint protecting features and which further increases body muscular strength and endurance.

A number of mouthguards currently exist in the art for protecting the teeth and for reducing the chance of shock, concussions and other injuries as a result of high impact collisions and blows during athletic competition. Mouthguards generally are characterized as being nonpersonalized, universal and stock model type, or are custom formed to have upper jaw and teeth direct contact. Additionally, mouthguards may be tethered or untethered. Tethered mouthguards are usually connected to a fastening point, such as a helmet or face guard, to prevent the chance of the mouthguard from being lost as well as to prevent swallowing of the mouthguard or choking on the mouthguard by the user.

Failure to use a mouthguard or the use of an improperly fitted mouthguard when impacts, collisions or blows occur to the jaw structure of an athlete have recently been found to be responsible for athletes' susceptibility to headaches, presence of earaches, ringing in the ears, clogged ears, vertigo, concussions and dizziness. The cause of these types of health problems and injuries are generally not visible by inspection of the mouth or jaw, but more particularly relate to the temporomandibular joint (TMJ) and surrounding tissues where the lower jaw is connected to the skull in the proximity where the auriculo-temporalis nerves and supra-temporal arteries pass from the neck nerves into the skull to the brain.

Most mouthguards in the past have been made from ethylene vinyl acetate (EVA). The material has a softening point approximating the temperature of boiling water which will permit the mouthguard to be placed in boiling water and custom fit to the wearer's mouth. However, the EVA material, although the best known to date, is not ideal for absorption, attenuation and dissipation of shock forces exerted on the EVA mouthguard during athletic activity. Furthermore, the EVA material is subject to deformation and break down with continued use and chewing thereon by the wearer.

There is a need for a mouthguard that may be fit by the user, practitioners, dentists, equipment personnel and trainers that will custom fit with direct contact with the upper jaw's teeth. Such a mouthguard should absorb, attenuate and dissipate shock forces exerted on the mouthguard during athletic activity, permit a positioning of the lower jaw into the power position for increased endurance and muscular power, will facilitate breathing and speech, and will reduce pressure and possible concussion impact upon the cartilage of the joint, the joint itself, the arteries and the nerves in proximity of the joints.

SUMMARY OF THE INVENTION

A composite mouthguard has a flexible and tough, softenable thermoplastic mouthguard portion with a U-shaped base having upward inner lingual and outer labial walls extending therefrom. A shock absorbing

and attenuating nonsoftening, resilient, low compression, elastomer framework is embedded in the mouthguard portion to absorb, attenuate and dissipate shock forces exerted on the mouthguard during athletic activity.

A principal object and advantage of the present invention is that the mouthguard is of a composite construction permitting the formation of a customized thermoplastic mouthguard portion protecting the teeth, jaws and gums with an internal, shock absorbing, nonsoftening, resilient, low compression, elastomeric framework therein to further absorb, attenuate and dissipate shock forces exerted on the mouthguard.

Another object and advantage of the present invention is the elastomeric framework may begin as an anterior impact brace on the anterior portion of the mouthguard contacting the anterior teeth and extending through the base portion of the mouthguard forming cushioning pads in the occlusal regions for the posterior teeth to absorb, attenuate and dissipate shock as heretofore not known.

Another object and advantage of the present invention is that the posterior cushion pads of the framework may have enlarged portions which assist in custom fitting of the lower jaw to the power position as well as further providing the advantage of absorption, attenuation and dissipation of shock.

Another object and advantage of the present invention is that the composite material with the elastomeric framework within the thermoplastic mouthguard portion will resist wear and break down of the mouthguard otherwise associated with EVA mouthguards.

Another object and advantage of the present invention is that the elastomeric framework, which is not softened under boiling water, will permit the appropriate power positioning of the lower jaw despite the softening of the thermoplastic mouthguard portion, thereby assuring proper fitting of the composite mouthguard.

Another object and advantage of the present invention is that the elastomeric framework has enlarged portions and an anterior impact brace within the thermoplastic mouthguard portion where shock forces are most likely to be exerted upon the mouthguard for resilient absorption, attenuation and dissipation of shock forces.

Another object and advantage of the present invention is that occlusal thermoplastic posterior pads may be included in the mouthguard portion wherein the elastomeric framework may be embedded to provide the absorption, attenuation and shock dissipation qualities as well as permitting the mouthguard and lower jaw to be formed and placed in the power position moving the condyle downwardly and forwardly away from the nerves and arteries within the fossae or socket to increase body muscular strength, greater endurance and improved performance by the mouthguard user.

Other objects and advantages will become obvious with a reading of the following specification and appended claims with a review of the FIGURES.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a maxillary mandibular buccal or partial side elevational view of the jaws and temporomandibular joint of a user of a mouthguard of the present invention;

FIG. 1A is an enlarged view of the circled temporomandibular joint portion of FIG. 1;

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FIG. 2 is a top plan view of the composite mouthguard showing the anterior teeth contacting the anterior cushioning pads of the anterior impact brace of the elastomeric framework with the thermoplastic mouthguard portion shown in phantom outline;

FIG. 3 is a perspective view of the composite mouthguard showing the elastomeric framework connected to a wishbone tether with the thermoplastic mouthguard portion shown in phantom outline therearound;

FIG. 4 is a cross-sectional view taken along lines 4-4 10 of FIG. 2;

FIG. 5 is a perspective view of the composite mouthguard with portions of the elastomeric framework shown in phantom outline; and

FIG. 6 is a partial side elevational view of the jaws similar to FIG. 1 with the elastomeric framework of the composite mouthguard partially broken away and the thermoplastic mouthguard shown in phantom outline.

DETAILED SPECIFICATION

To understand the structural features and benefits of the mouthguard 60 of the present invention, some anatomy will first be described. Referring to FIGS. 1 and 1A, the mouthguard user would have a mouth 10, generally comprised of a rigid upper jaw 12 and a movable lower jaw 42 which are movably connected at the temporomandibular joint (TMJ) 32 and 50.

More specifically, the rigid upper jaw 12 has gum tissue 14 within mouth 10. Gum tissue 14, as well as the bone thereunder, support anterior teeth (incisors and canines) 18 which have incisal or biting surfaces. The gum tissues 14 and the bone thereunder also support posterior teeth (molars and bicuspids) 22 which have cusps and biting surfaces 26.

Referring to one side of the human head, the temporal bone 28 is located upwardly and rearwardly of the upper jaw 12 and is in the range of 1/16 to 1/32 inch thick. The articular eminence 30 forms the beginning of the fossa 32 or the socket of the temporomandibular joint 32 and 50. Rearwardly and posteriorly to the articular eminence 30 is located cartilage 34. Through the temporomandibular joint 32 and 50 pass the auriculo-temporal nerve 36 and the supra-temporal artery. Posteriorly to this structure is located the inner ear.

The movable jaw or mandible 42 supports a bone covered by gum tissue 44 which further supports anterior teeth (incisors and canines) 46 and posterior teeth (molars and bicuspids) 48 with occlusal surfaces 52. The condyle 50 of the lower jaw 42 forms the ball of the temporomandibular joint 32 and 50. This anatomical structure is the same for both sides of the head.

Repeated impacts, collisions, blows or forces exerted on the movable lower jaw 42 result in excessive wearing forces upon the condyle 50 and the cartilage or disc 34 - typically resulting in deterioration or slippage of the cartilage 34. Thereafter, the lower jaw 42 may be subject to irregular movement, loss of comfortable range of movement and clicking of the joint 32 and 50.

The auriculo-temporal nerve 36 relates to both sensory and motor activities of the body. Any impingement or pinching of this nerve 36 can result in health problems as previously mentioned. The supra-temporal artery 38 is important in that it provides blood circulation to the head. Impingement, pinching, rupture or blockage of this artery 38 will result in possible loss of consciousness and reduced physical ability and endurance due to the restriction of blood flow to the brain. Thus, it is extremely important to assure that the condyle 50

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does not impinge upon the auriculo-temporal nerve 36 or the supra-temporal artery 38.

It is also important to note that the temporal bone 28 is not too thick. Medical science has known that a sharp shock or concussive force applied to the lower jaw 42 possibly could result in the condyle 50 protruding through the temporal bone 28 thereby causing death. This incident rarely, but sometimes, occurs with respect to boxing athletes.

Referring to FIGS. 2-6, the composite mouthguard may be generally seen. Mouthguard 60 is comprised of a thermoplastic mouthguard portion 61, which is generally horse shoe or U-shaped, with the embedded or substantially internal elastomeric framework 78 forming posterior cushion pads 80 and an anterior impact brace 90.

More particularly, the thermoplastic mouthguard portion 61 suitably may be made of copolymers of ethylene and vinyl acetate, such as ethylene vinyl acetate (EVA) which is commercially available and approved for oral use by the Food and Drug Administration. The thermoplastic mouthguard portion 61 has a U-shaped base 62 with a top side 64 and a bottom side 66. Extending upwardly are inner lingual and outer labial walls 68 and 70 forming a channel therebetween for receiving the upper jaw and teeth 12, 18 and 22. The thermoplastic mouthguard portion 61 has a posterior portion 72 and an anterior portion 74.

Located along the bottom side 66 of the posterior portion 72 of the U-shaped base 62 may be located optional thermoplastic occlusal posterior pads 76. These thermoplastic occlusal posterior pads 76 space apart the anterior teeth 46 of the lower jaw 42 from the anterior portion 74 of the bottom side 66 of the U-shaped base 62. This arrangement facilitates breathing and speech, and lessens condyle 50 pressure and impact upon the cartilage 34, the temporomandibular joints 32 and 50, the arteries 38 and the nerves 36.

The optional occlusal posterior pads 76 also permit the lower jaw 42 to be positioned forwardly and anteriorly in a range of 1 to 4 millimeters depending upon the desired position to assume the power position allowing the most freedom and least amount of potential impingement to the TMJ 32 and 50 and surrounding tissues.

The elastomeric framework 78 suitably is made of an elastomer, which unlike copolymers of ethylene and vinyl acetate, exhibits a high resilience, low compression, shape maintenance and shock absorption, attenuation and dissipation. Virtually all rubbers that exhibit these physical characteristics may be utilized for the elastomeric framework 78, including vulcanized rubber. Applicant has found a thermoplastic rubber marketed under the trademark KRATON® works well, which is marketed by GLS Plastics of 740B Industrial Drive, Cary, Illinois 60013. This thermoplastic rubber is unique in that it is injection moldable, FDA approved and readily adheres with copolymers of ethylene and vinyl acetate. Furthermore, the thermoplastic rubber has a melting or softening point significantly higher than that of EVA.

Consequently, the elastomeric framework 78 is initially molded or formed after which the thermoplastic mouthguard portion 61 may be injection molded therearound.

The elastomeric framework 78 has posterior cushion pads 80 which suitably lay within the posterior portions 72 of the U-shaped base 62. Alternatively, the posterior

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cushion pads may be embedded within the occlusal posterior pads 76 or between the pads 76 and the U-shaped anterior base portions 62. The posterior cushion pads 80 suitably have enlarged portions 82 and 84 suitably in the bicuspid and molar regions of the teeth. The enlarged portions may take the form of spheres, columns, or knobs. The enlarged molar portions or spheres 84 are suitably positioned to fit in the area of the first adult molars as shown in FIG. 6. The bicuspid enlarged portions 82 appropriately fit on the bicuspid teeth adjacent the canine or eyeteeth.

The posterior cushion pads 80 together with the enlarged portions 82 and 84 cause the mandible or lower jaw 42 to slide forwardly and slightly downwardly while fitting the composite mouthguard 60. Also, the condyles 50 are moved downwardly and away from the fossae or sockets 32 without the need for exotic devices and/or measurements, articulation, etc. Furthermore, the posterior cushion pads 80 with the enlarged portions 82 and 84 assure proper fitting of the composite mouthguard 50 when softened by prohibiting the user from biting too deeply into the soft EVA material of the thermoplastic mouthguard portion 61. Also, the bicuspid enlarged portions 82 assure that there is no excessive upward displacement of the anterior portions of the lower movable jaw or mandible 42.

A raised ridge 86 on top and bottom of the posterior cushion pad 80 connects the enlarged portions 82 and 84. This ridge 86 has been found to force the softened EVA material of the thermoplastic mouthguard portion 61 to remain in the occlusal biting surfaces or grooves 26 while fitting.

Moving forwardly, a transition support portion 88 extends forwardly from the posterior cushion pads 80 and connects to the anterior impact brace 90. Anterior impact brace 90 has protruding anterior cushion pads 92 which extend through the upward outer labial wall 70 to actually contact the anterior teeth 18 of the upper jaw 12 as clearly shown in FIG. 2 to advantageously absorb, attenuate and dissipate shock exerted thereat. FIGS. 4 and 6 show double phantom lines without cross sectioning in the anterior portion 74 of the thermoplastic mouthguard portion 61 to illustrate that the copolymer mouthguard portion 61 at least partially surrounds the anterior cushion pads 92 to further embed the framework 78 in the anterior portion 74 of the mouthguard portion 61. The anterior cushion pads 92 extend rearwardly through the anterior portion 74 of the outer labial wall 70. A wishbone tether 94 (FIG. 3) suitably may be utilized with the composite mouthguard 60 and is the subject of Applicant's co-pending application.

In operation, the composite mouthguard 60 may be momentarily submerged suitably into boiling water. Thereafter, the mouthguard 60 is immediately placed onto the teeth 18 and 22 of the upper jaw 12. Next, the lower jaw 42 is positioned forwardly or anteriorly in a range of 1 to 4 millimeters as the posterior teeth 48 engage the enlarged portions 82 and 84 with or without occlusal posterior pads 76. The wearer or user then applies suction between the upper jaw 12 and the mouthguard 60 while packing the mouthguard 60 with the hands along the cheeks and lips adjacent the anterior and posterior teeth 18 and 22 of the upper jaw 12. The posterior teeth 48 of the lower jaw 42 will properly index upon the bottom surface of the occlusal posterior pads 76 or the posterior portion 72 of the U-shaped base 62.

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The user of the composite mouthguard will have correct jaw posture for athletic participation which will assure minimal impact injury to the TMJ 32 and 50 as well as the surrounding tissues, teeth and respective jaws. The elastomeric framework 78 with its component parts will absorb, attenuate and dissipate shock forces as heretofore not known. Furthermore, the user will experience increased endurance, performance and muscular freedom due to the power positioning and posture of the TMJ joints 32 and 50.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof; therefore, the illustrated embodiment should be considered in all respects as illustrative and not restrictive, reference being made to the appended claims rather than to the foregoing description to indicate the scope of the invention.

We claim:

1. A composite mouthguard for a user having an upper jaw with anterior teeth, posterior teeth with occlusal surfaces, and fossae with cartilage forming sockets, and a movable lower jaw with anterior teeth, posterior teeth with occlusal surfaces and condyles movably fitted within the sockets forming the temporomandibular joints through which the auriculo-temporalis nerves and supra-temporal arteries pass, the mouthguard comprising:

(a) a flexible and tough mouthguard portion made of a first material of a softenable thermoplastic having an U-shaped base with top and bottom sides with upward inner lingual and outer labial walls and further having posterior and anterior portions; and
 (b) a shock absorbing and attenuating framework made of a second material of a nonsoftening, resilient, low compression elastomer which is embedded in the mouthguard posterior portions of the mouthguard base comprised of a posterior cushion pad in each posterior portion wherein the elastomeric framework extends forwardly from the posterior cushion pads to form an anterior impact brace on the anterior portion of the upward outer labial wall and at least partially extends through the labial wall to form anterior cushion pads to touch the anterior teeth of the upper jaw to absorb, attenuate and dissipate shock forces exerted on the mouthguard during athletic activity.

2. A composite mouthguard for a user having an upper jaw with anterior teeth, posterior teeth with occlusal surfaces, and fossae with cartilage forming sockets, and a movable lower jaw with anterior teeth, posterior teeth with occlusal surfaces and condyles movably fitted within the sockets forming the temporomandibular joints through which the auriculo-temporalis nerves and supra-temporal arteries pass, the mouthguard comprising:

(a) a flexible and tough mouthguard portion made of a first material of a softenable thermoplastic having an U-shaped base with top and bottom sides with upward inner lingual and outer labial walls and further having posterior and anterior portions; and
 (b) a shock absorbing and attenuating framework made of a second material of a nonsoftening, resilient, low compression elastomer which is embedded in the mouthguard posterior portions of the mouthguard base comprised of a posterior cushion pad in each posterior portion each with enlarged portions in an area of a molar tooth and bicuspid tooth to absorb, attenuate and dissipate shock

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forces exerted on the mouthguard during athletic activity.

3. The composite mouthguard of claim 2, further comprising a raised ridge on each posterior cushion pad extending from the enlarged portions.

4. The composite mouthguard of claim 2, further comprising thermoplastic occlusal poster pads on the bottom side of the base along only the posterior portions to space apart the anterior teeth of the lower jaw from the anterior portion of the bottom side of the U-shaped base to facilitate breathing and speech and to lessen condyles pressure and impact upon the cartilage, and temporomandibular joints, the arteries and the nerves.

5. The composite mouthguard of claim 4, wherein the elastomeric posterior cushion pads are embedded in the thermoplastic occlusal posterior pads.

6. The composite mouthguard of claim 2, wherein the framework extends outwardly from the posterior cushion pads to form an anterior impact brace on the anterior portion of the upward outer labial wall and at least partially extends through the labial wall to form anterior cushion pads to touch the anterior teeth of the upper law.

7. The composite mouthguard of claim 2, wherein the mouthguard portion first material is made from a thermoplastic comprised of copolymers of ethylene or vinyl acetate.

8. The composite mouthguard of claim 2, wherein the framework second material is made from an elastomeric material of a group comprising thermoplastic rubber or vulcanized rubber.

9. A composite mouthguard for a user having an upper jaw with anterior teeth, posterior teeth with occlusal surfaces, and fossae with cartilage forming sockets, and a movable lower jaw with anterior teeth, posterior teeth with occlusal surfaces and condyles movably fitted within the sockets forming the temporomandibular joints through which the auriculo-temporalis nerves and supra-temporal arteries pass, the mouthguard comprising:

(a) a flexible and tough, softenable thermoplastic mouthguard portion having an U-shaped base with top and bottom sides with upward inner lingual and outer labial walls and further having posterior and anterior portions; and

(b) a shock absorbing and attenuating nonsoftening, resilient, low compression, elastomeric framework embedded in the mouthguard portion to absorb, attenuate and dissipate shock forces exerted on the mouthguard during athletic activity, wherein the elastomeric framework forms an anterior impact brace on the anterior portion of the upward outer labial wall and extends rearwardly to form posterior cushion pads in the posterior portions of the mouthguard base and wherein the anterior impact brace at least partially extends through the labial wall to form anterior cushion pads to touch the anterior teeth of the upper jaw.

10. The composite mouthguard of claim 9, wherein each posterior cushion pad has an enlarged portion above and below the cushion pad in an area of a molar tooth.

11. The composite mouthguard of claim 10, wherein each posterior cushion pad has a second enlarged portion in an area of a bicuspid tooth.

12. The composite mouthguard of claim 9, wherein each posterior cushion pad has two enlarged portions

5 above and below the cushion pad in areas of molar and bicuspid teeth.

13. The composite mouthguard of claim 12, further comprising a raised ridge on each posterior cushion pad extending from the enlarged portions.

14. The composite mouthguard of claim 9, further comprising thermoplastic occlusal poster pads on the bottom side of the base along only the posterior portions to space apart the anterior teeth of the lower jaw from the anterior portion of the bottom side of the U-shaped base to facilitate breathing and speech and to lessen condyles pressure and impact upon the cartilage, and temporomandibular joints, the arteries and the nerves.

15. The composite mouthguard of claim 14, wherein the elastomeric posterior cushion pads are embedded in the thermoplastic occlusal posterior pads.

16. The composite mouthguard of claim 9, wherein the thermoplastic mouthguard is made from copolymers of ethylene or vinyl acetate.

17. The composite mouthguard of claim 9, wherein the elastomeric framework is made from a material of a group comprising thermoplastic rubber or vulcanized rubber.

18. A composite mouthguard for a user having an upper jaw with anterior teeth, posterior teeth with occlusal surfaces, and fossae with cartilage forming sockets, and a movable lower jaw with anterior teeth, posterior teeth with occlusal surfaces and condyles movably fitted within the sockets forming the temporomandibular joints through which the auriculo-temporalis nerves and supra-temporal arteries pass, the mouthguard comprising:

(a) a flexible and tough, softenable thermoplastic mouthguard portion having an U-shaped base with top and bottom sides with upward inner lingual and outer labial walls and further having posterior and anterior portions;

(b) a shock absorbing and attenuating non-softening, resilient, low compression, elastomeric framework embedded in the mouthguard portion to absorb, attenuate and dissipate shock forces exerted on the mouthguard during athletic activity, wherein the elastomeric framework forms an anterior impact brace on the anterior portion of the upward outer labial wall and extends rearwardly to form posterior cushion pads in the posterior portions of the mouthguard base;

(c) two enlarged portions on each posterior cushion pad in areas of bicuspid and molar teeth; and

(d) anterior cushion pads on the anterior impact brace extending rearwardly through the labial wall to touch the anterior teeth of the upper jaw.

19. The composite mouthguard of claim 18, further comprising a raised ridge on each posterior cushion pad extending from the enlarged portions.

20. The composite mouthguard of claim 18, further comprising thermoplastic occlusal poster pads on the bottom side of the base along only the posterior portions to space apart the anterior teeth of the lower jaw from the anterior portion of the bottom side of the U-shaped base to facilitate breathing and speech and to lessen condyles pressure and impact upon the cartilage, and temporomandibular joints, the arteries and the nerves.

21. The composite mouthguard of claim 20, wherein the elastomeric posterior cushion pads are embedded in the thermoplastic occlusal posterior pads.

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22. The composite mouthguard of claim 18, wherein the thermoplastic mouthguard is made from copolymers of ethylene or vinyl acetate.

23. The composite mouthguard of claim 18, wherein

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the elastomeric framework is made from a material of a group comprising thermoplastic rubber or vulcanized rubber.

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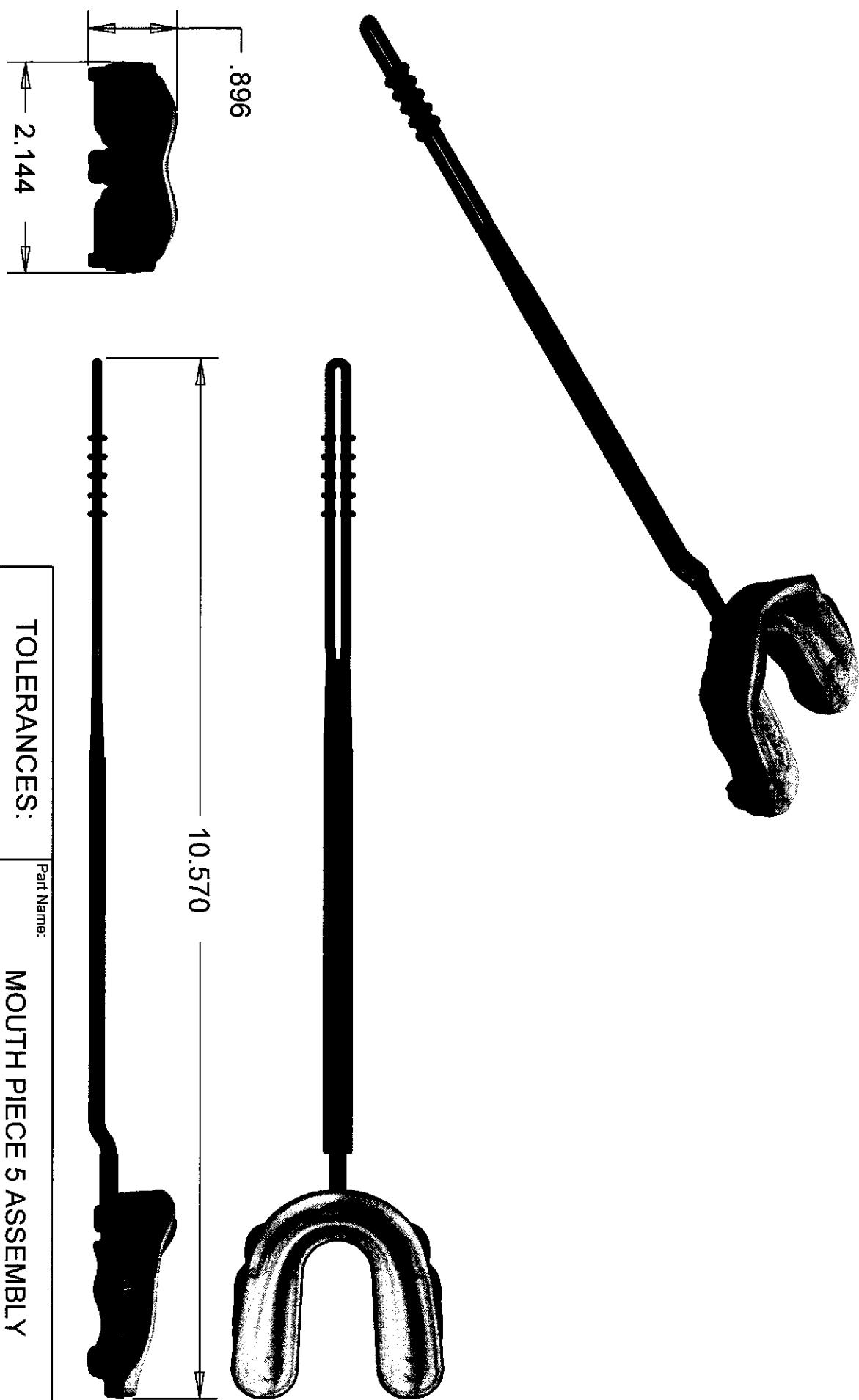
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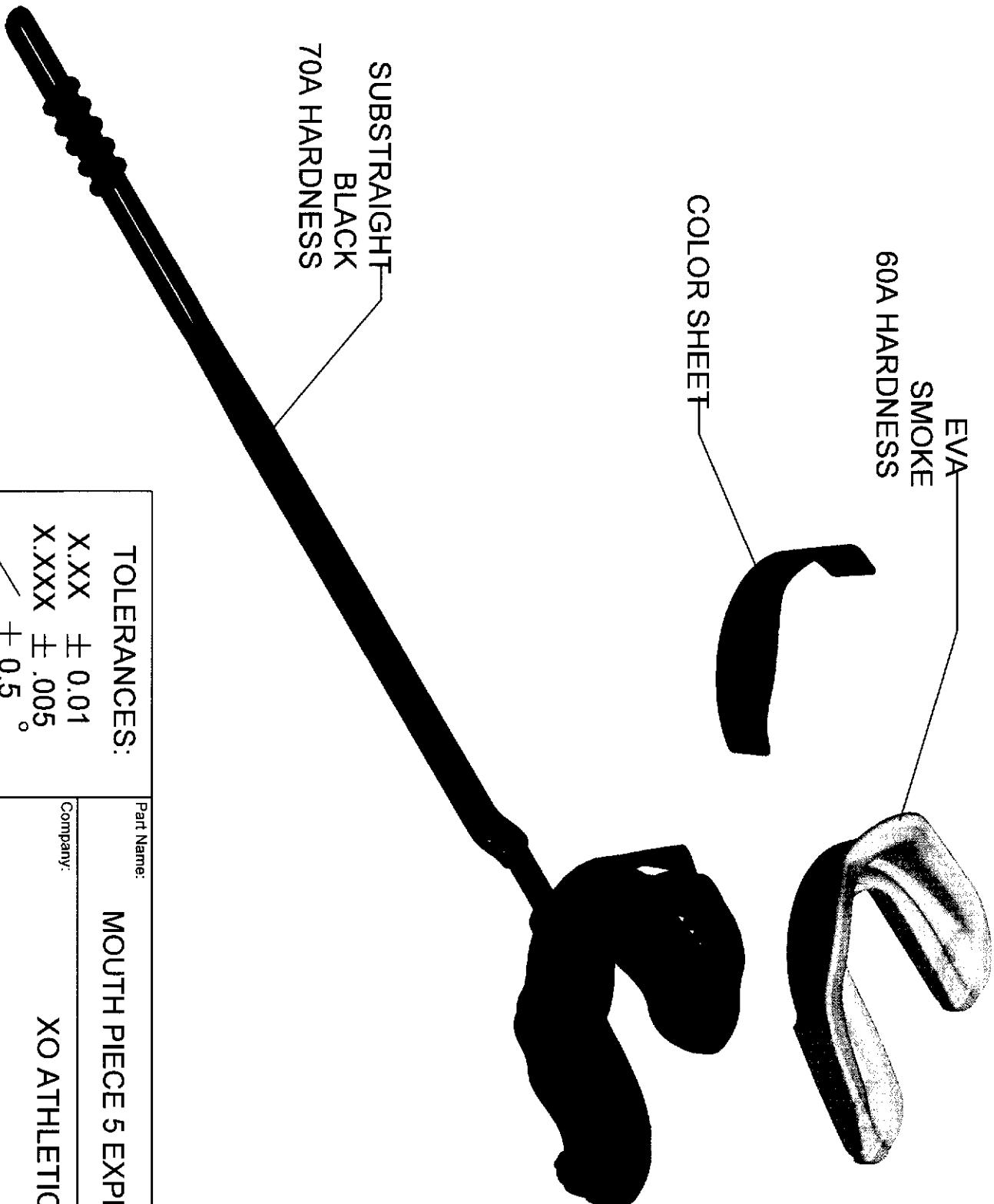
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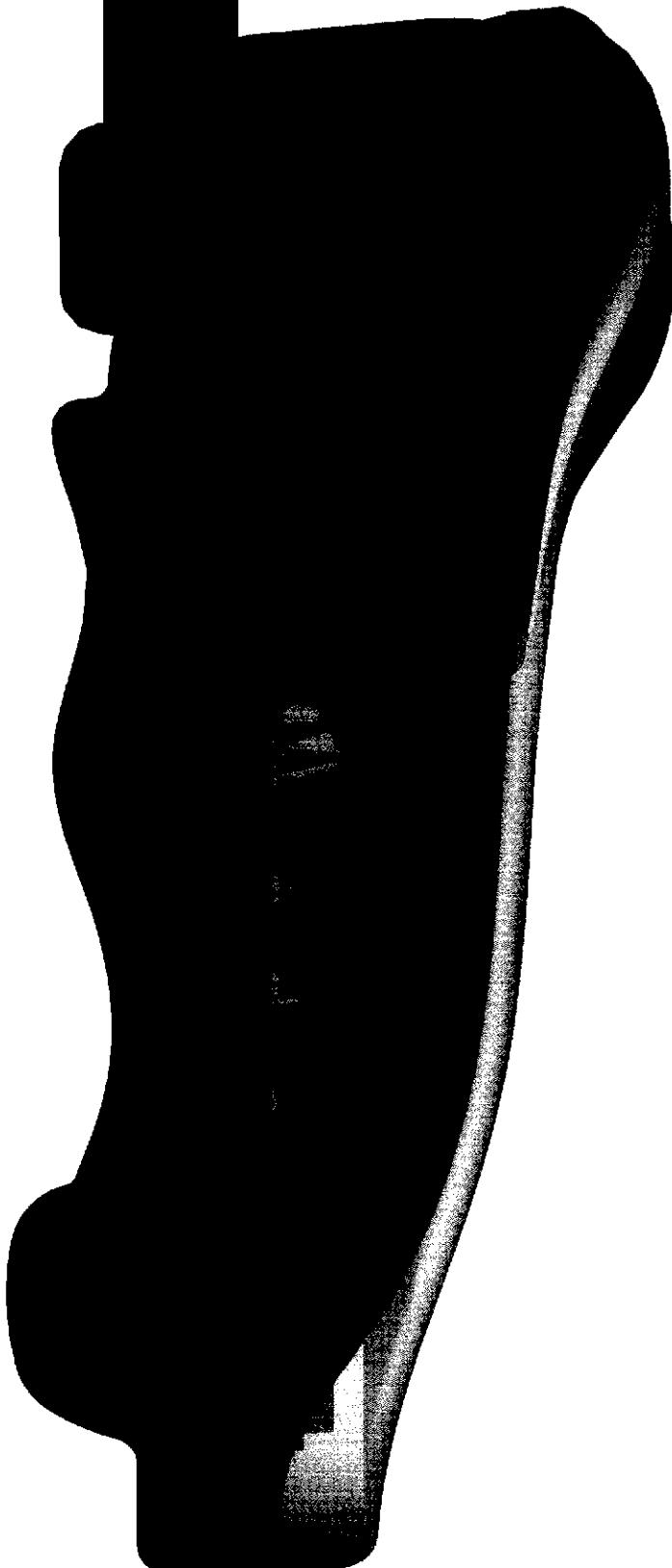




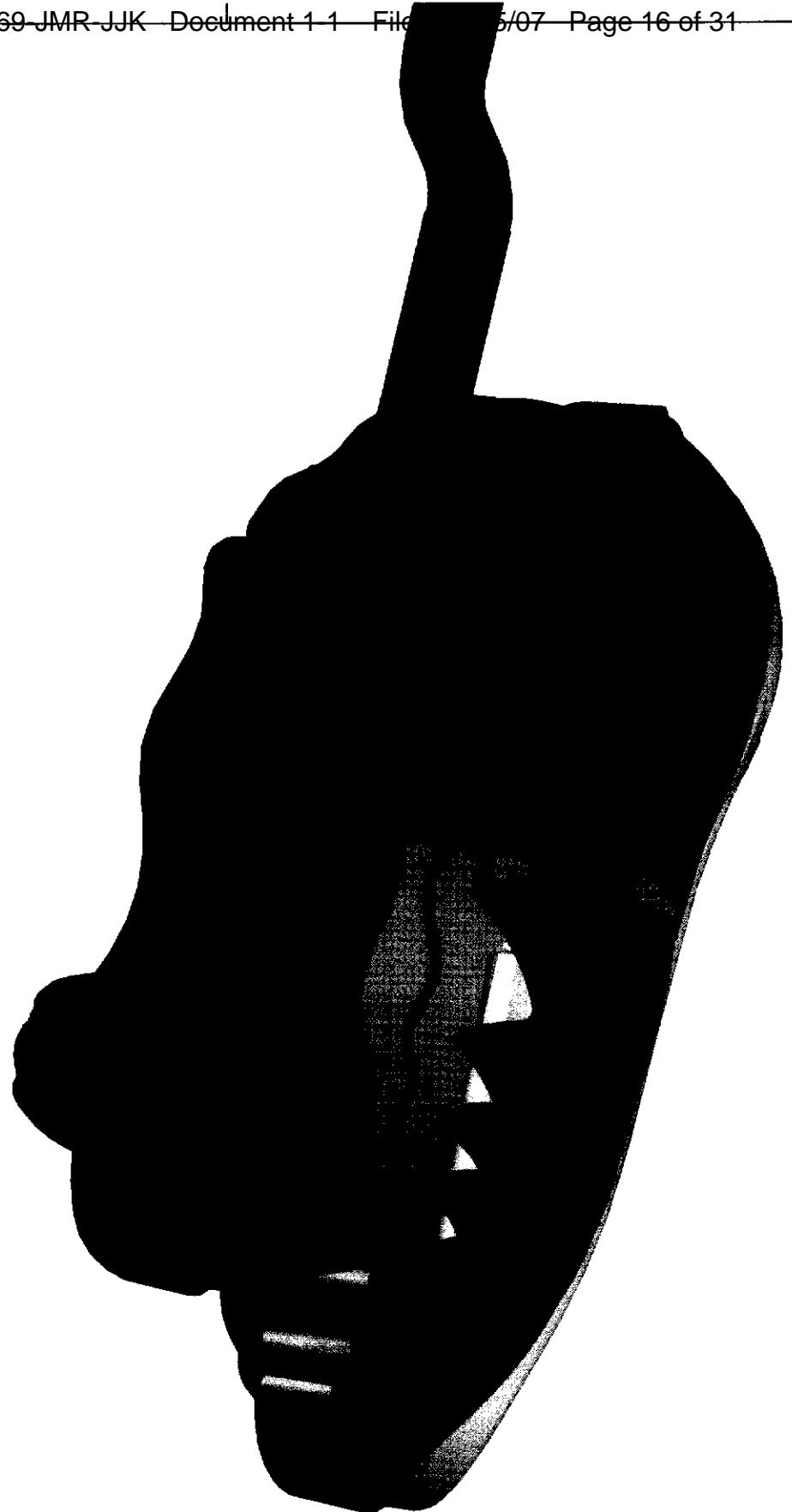
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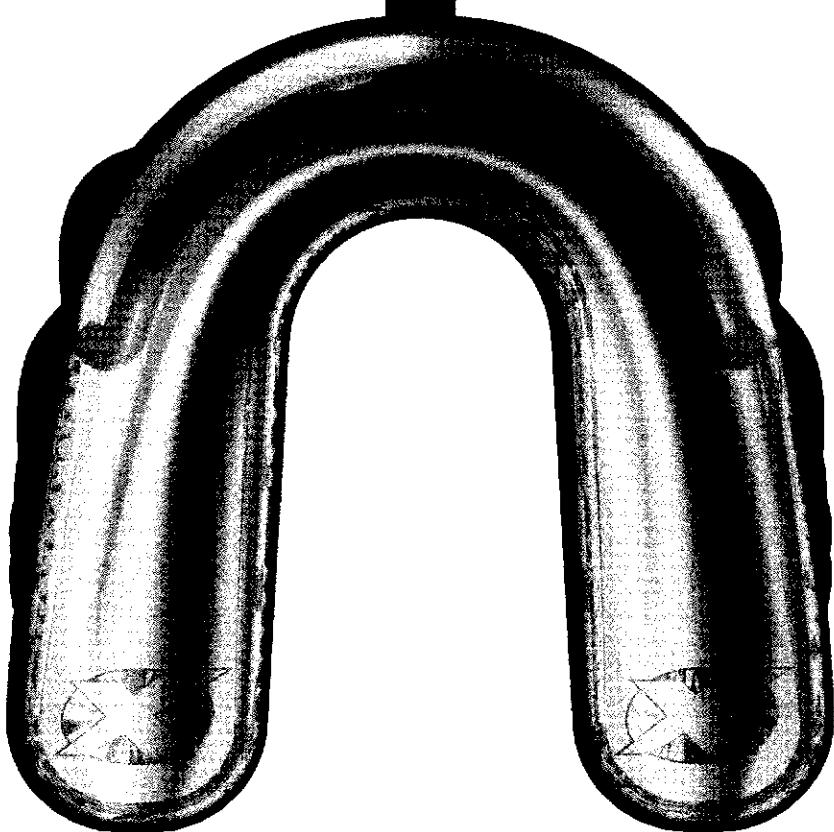
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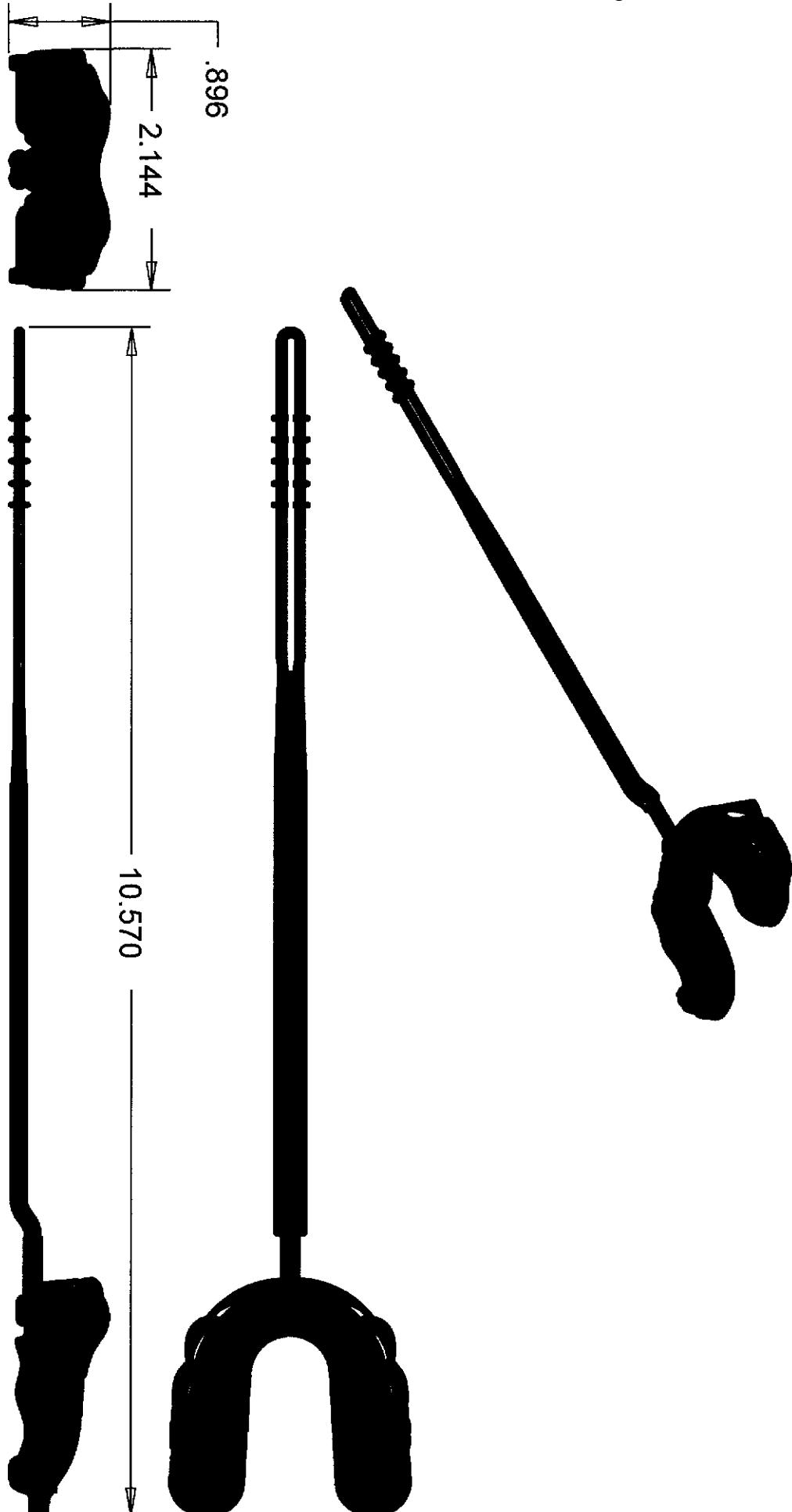
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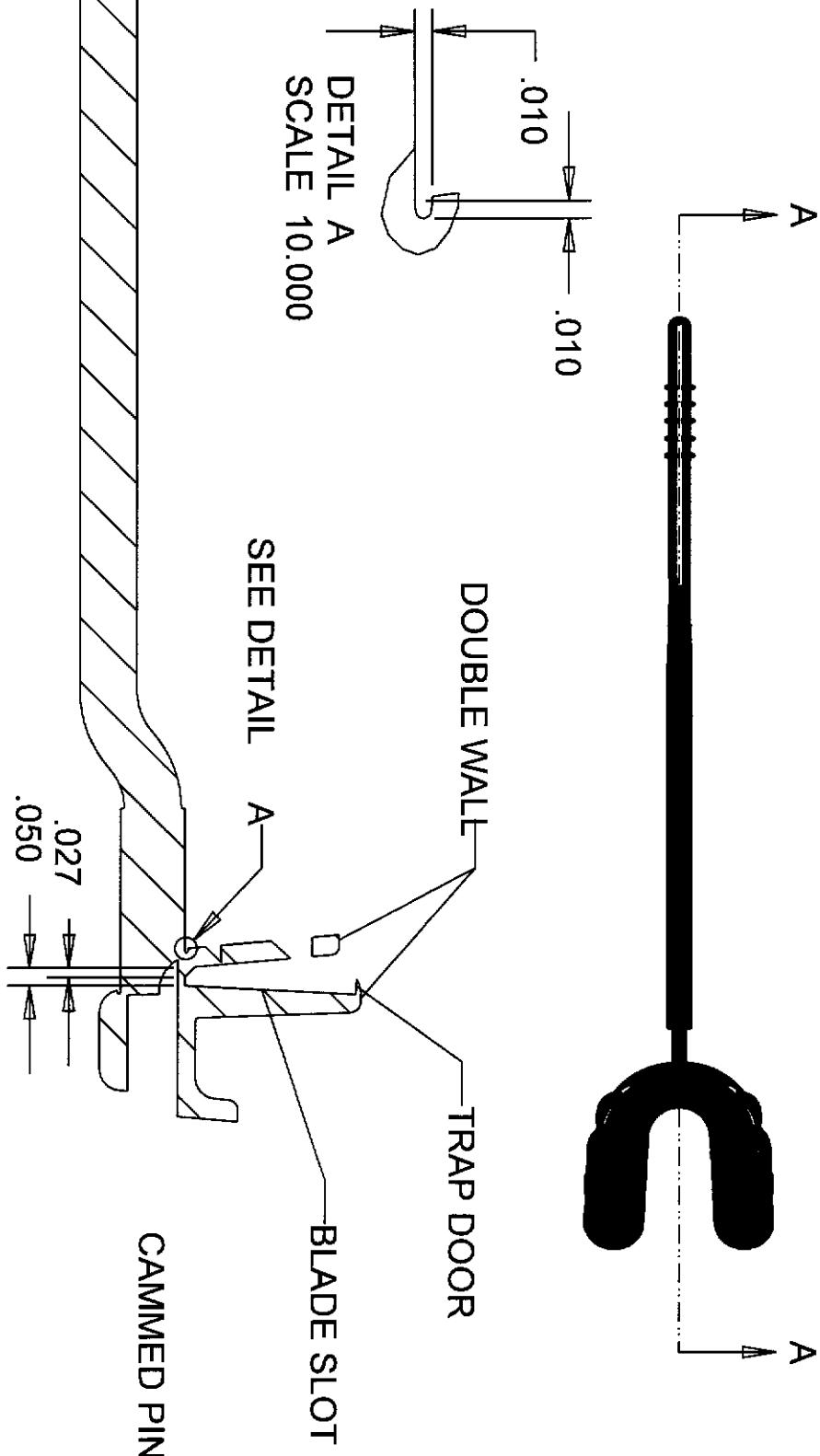
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X.XXX ± .005			
∠ ± 0.5°		Type: Project Name: MOUTH PIECE 5	
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DRAWN BY: BL	REV:		



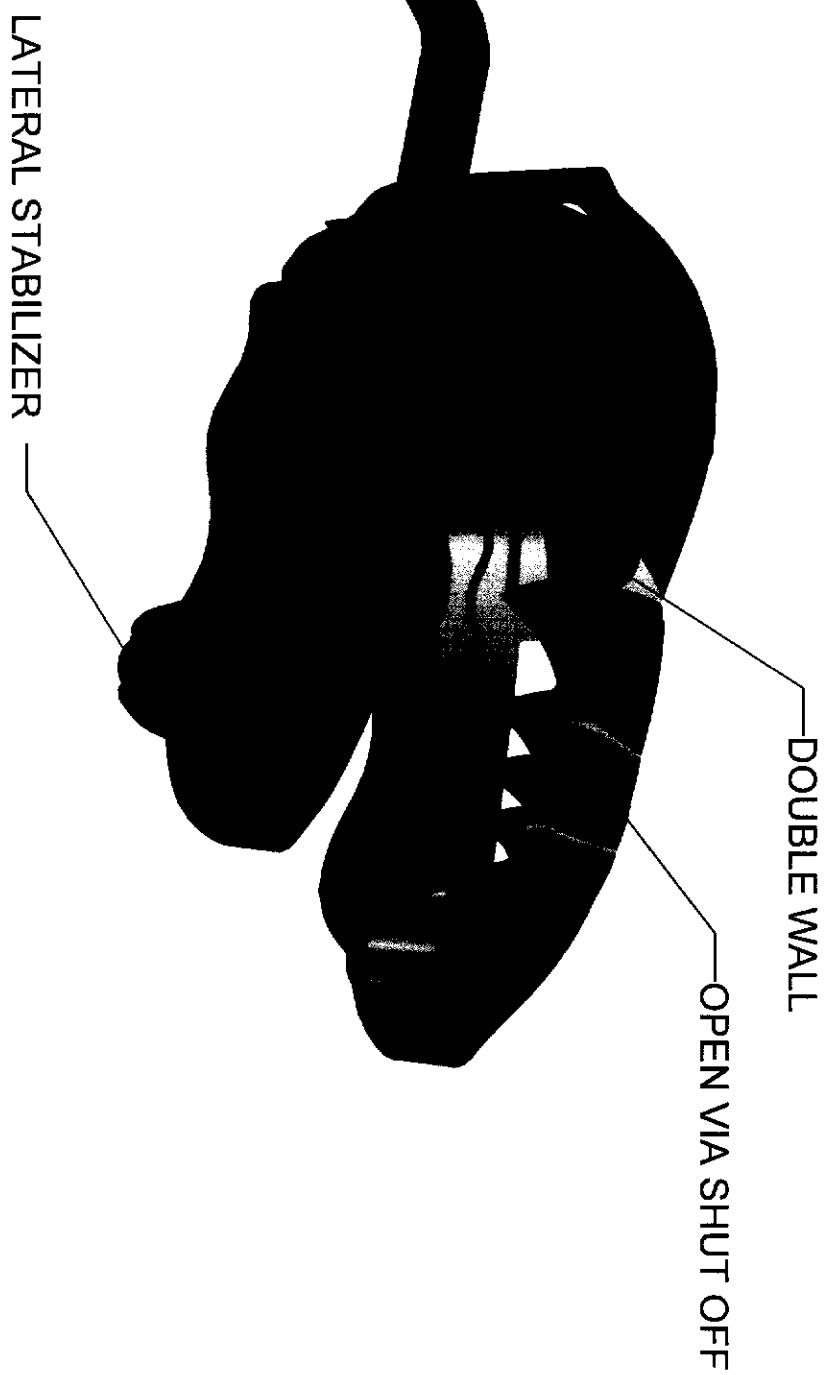
NOTES:

1. MAT'L: TPE - BLACK
TARGET 70 A HARDNESS
2. VOLUME: .936 CU.IN.

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∠	± 0.5°	XO ATHLETIC	
TYP. PROJECTION FRONT <input checked="" type="checkbox"/>	RIGHT <input type="checkbox"/>	Type:	Project Name:
BACK <input type="checkbox"/>			MOUTh PIECE 5
DRAWN BY: BL	REV:	Rev Date:	Date Print:
			9/6/2007



TOLERANCES:		Part Name:	Project Name:	
X.XX	± 0.01	SUBSTRAIGHT		
X.XXX	$\pm .005$	XO ATHLETIC		
\angle	$\pm 0.5^\circ$			
TYP. PROJECTION FRONT <input checked="" type="checkbox"/>	RIGHT <input type="checkbox"/>	BACK <input type="checkbox"/>	Type:	Project Name:
DRAWN BY: BL	REV:	Rev Date:	MOUTH PIECE 5	Date Print:
				9/6/2007



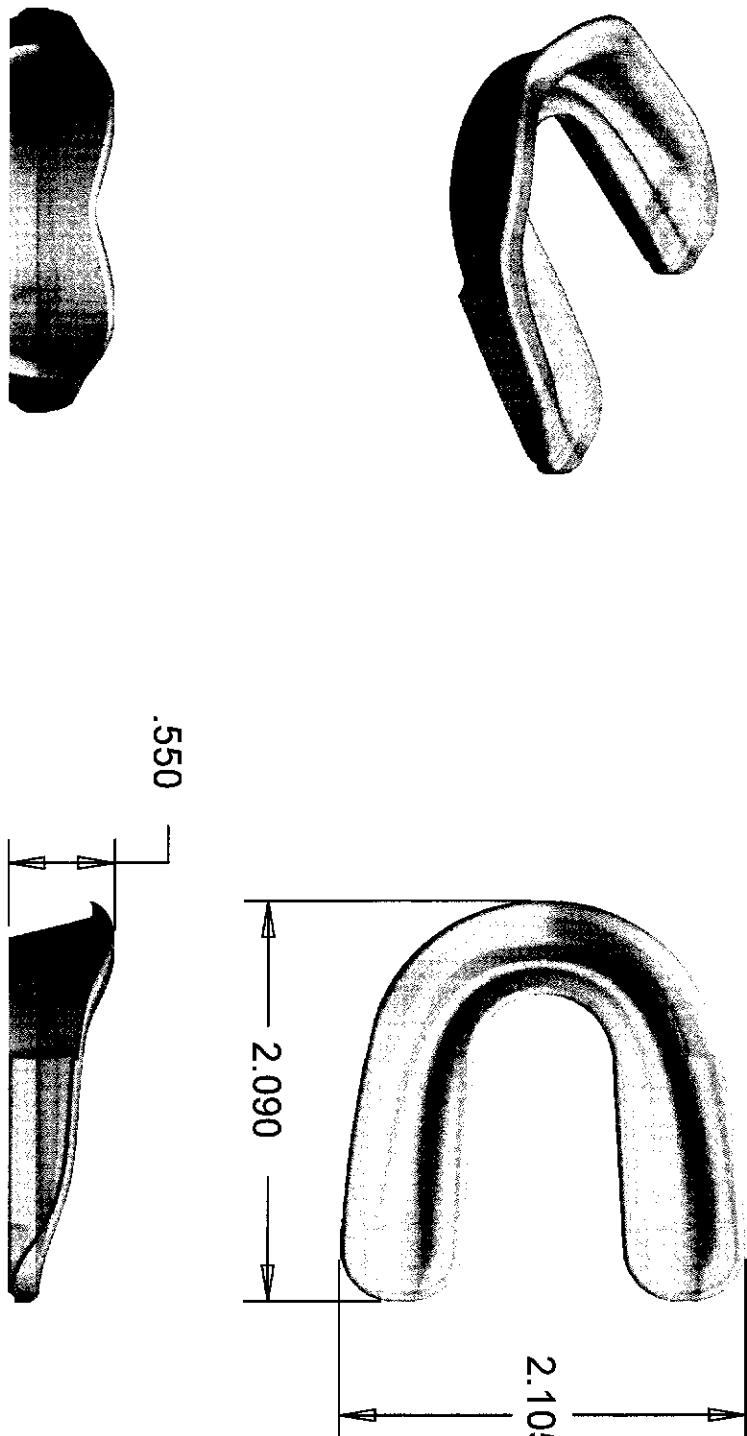
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X.XXX	$\pm .005$
\angle	$\pm 0.5^\circ$
TYP. PROJECTION FRONT <input checked="" type="checkbox"/>	RIGHT <input type="checkbox"/>
DRAWN BY: BL	REV: 9/6/2007
Part Name: SUBSTRAIGHT	Project Name: XO ATHLETIC
Type:	Rev Date: Date Print:



INNER WALL IS HIGHER THAN
OUTER WALL BEFORE EVA SHOT

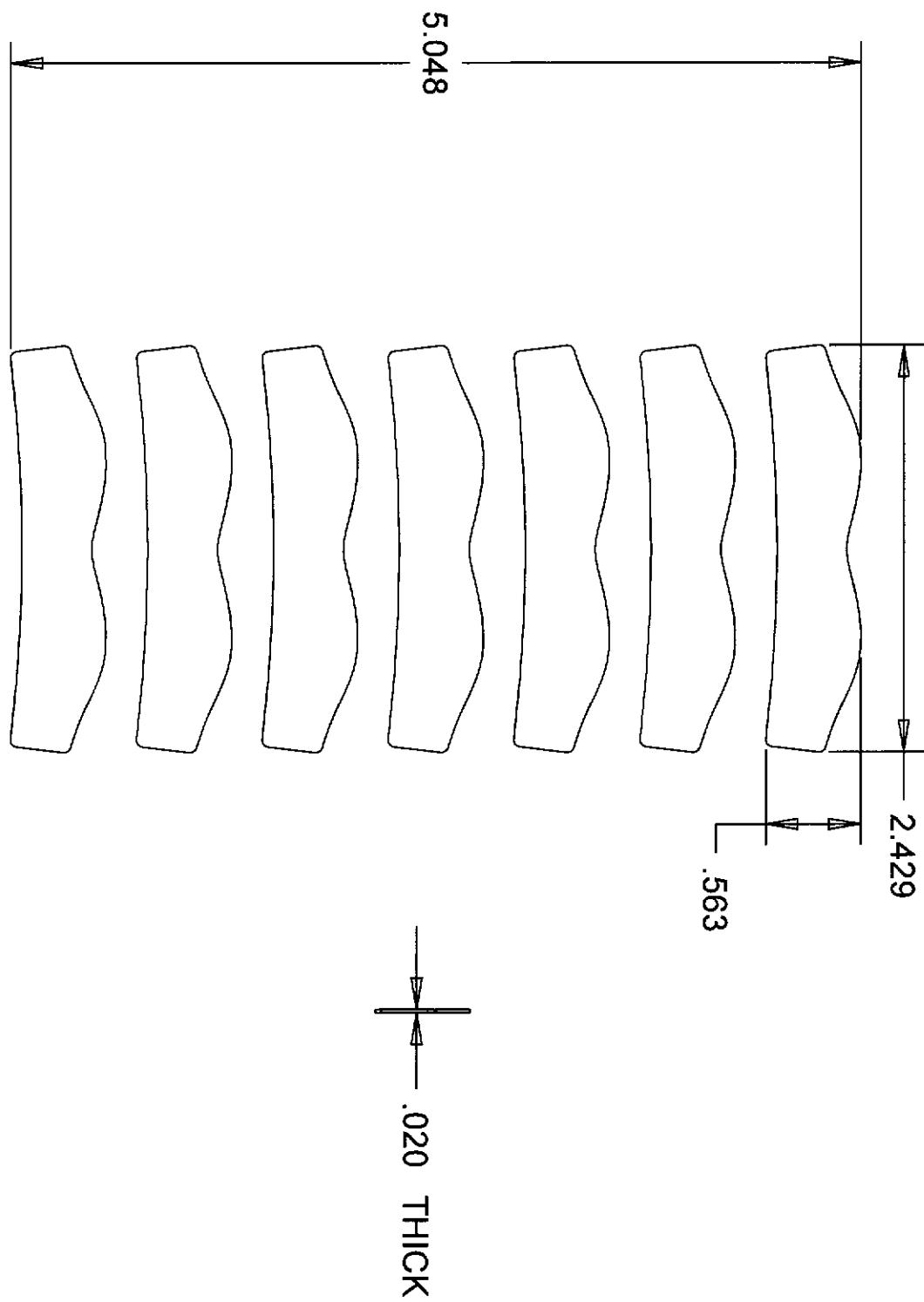
TOLERANCES:	
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X.XXX	$\pm .005$
\angle	$\pm 0.5^\circ$
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DRAWN BY: BL	REV: 9/6/2007
Part Name: SUBSTRAIGHT	Project Name: MOUTH PIECE 5
Company: XO ATHLETIC	Rev Date: Date Print: 9/6/2007

NOTES:
 1. MAT'L: EVA - SMOKE
 TARGET 60 A HARDNESS
 2. VOLUME: .470 CU.IN.



TOLERANCES:		Part Name:	
X.XX	± 0.01	EVA	
X.XXX	$\pm .005$	Company:	
\angle	$\pm 0.5^\circ$	XO ATHLETIC	
TYPE, PROJECTION FRONT <input checked="" type="radio"/>	RIGHT <input type="checkbox"/>	Type:	Project Name:
BACK <input type="radio"/>			MOUTH PIECE 5
DRAWN BY: BL	REV:	Rev Date:	Date Print:
			9/6/2007

NOTES
1. FULL SCALE



TOLERANCES:		Part Name: COLOR SHEET 5 PRINT LAYOUT	
X.XX	± 0.01	Company:	XO ATHLETIC
X.XXX	± .005		
∠	± 0.5 °		
TYP. PROJECTION FRONT <input checked="" type="radio"/>	RIGHT <input type="checkbox"/>	Type:	Project Name: MOUTH PIECE 5
DRAWN BY: BL	REV:	Rev Date:	Date Print: 9/6/2007

EXHIBIT C

EMPLOYMENT AND NON-COMPETITION AGREEMENT

This Employment and Non-Competition Agreement (the "Agreement") is entered into as of the last date set forth below by and between EZ Gard Industries, Inc., a Minnesota corporation ("Employer") and Paul J. Andre ("Employee"), in accordance with the following terms and conditions:

1.

Employment. Employer hereby employs, engages and hires Employee for the position of Director of Team Sales and Employee hereby accepts and agrees to such hiring, engagement and employment, subject to the general supervision and pursuant to the orders, advice and direction of Employer.

2.

Best Efforts of Employee. Employee agrees to devote all necessary time, energy and efforts to the position set forth above and will not engage in any consulting, freelance or part-time position or work, without Employer's prior written consent, which would limit in any respect Employee's ability to devote his or her time, energy and efforts as required herein. Employee agrees to comply with all of Employer's guidelines, policies and procedures.

3.

Term of Employment. The term of this Employment Agreement shall be indefinite, commencing 10/3/05 and subject to termination as set forth in section 6.1 hereof.

4.

Compensation of Employee. Employer shall pay Employee, and Employee shall accept from Employer, in full payment for Employee's services hereunder, compensation at the rate of \$ 8,00 per month, payable in increments as determined by Employer. Such compensation is subject to increases or decreases and payment of bonuses, together with payment of such benefits as Employer may, in its sole discretion, determine.

Restriction Against Competition: Protection of Proprietary Interests.

5.1 Acknowledgments Regarding Confidentiality. Employee acknowledges that Employee will be employed in a position of trust and confidence and will have access to and become familiar with the unique methods, services and procedures used by Employer. Employee understands that Employer over the years has built a lucrative business and that Employer has obtained and will obtain many customers, and that all the above constitute valuable, special and unique assets of Employer's business. Employee acknowledges that disclosure of the confidential or proprietary information, trade secrets or other information relating to the operation of Employer's business or use of trade secrets or other information relating to the operation of Employer's business or use of or access to such information by Employer's competitors will have a serious detrimental effect upon Employer, the monetary loss from which would be difficult, if not impossible, to measure.

5.2 Disclosures and Use by Employee. Employee will not, during or at any time after the term of employment under this Agreement, divulge, disclose or communicate to any person or entity, or use for Employee's benefit or for the benefit of any third party, in any manner whatsoever, whether directly or indirectly, any information concerning any matters affecting or relating to the business of Employer, including any of its customers, the prices it obtains or has obtained from the sale of, or at which it sells or has sold, its products, or any other information concerning its business, its manner of operation, its plans, processes, specifications, merchandising techniques, or other data. Employee understands that such matters and information are important, material, and confidential and are necessary to the effective and successful conduct of Employer's business and goodwill, and that any breach of the terms of this paragraph shall be a material breach of this agreement.

5.3 Ownership Rights: Confidentiality. Employee shall not acquire any rights hereunder or during employment to any documents, records, tangible property, goodwill, trade secrets, customer lists, proprietary interests or other property of Employer, whether tangible or intangible. All such technical and business information of Employer, including any records or documents which Employee shall compile while employed with Employer, are to be

considered confidential. No copies shall be made nor will any part of such information be given to any third party without Employer's prior consent. Employee agrees to return all such records, documents and tangible property to Employer upon termination of employment or at such earlier time as Employer may request.

5.4 Agreement Not to Compete.

a. **During and Subsequent to Employment.** Throughout the period of Employee's employment with Employer, and thereafter for the period described in section 5.4(c) set forth below, Employee shall not, for any reason whatsoever, directly or indirectly, plan, organize, advise, own, manage, operate, control, be employed by, participate in or be connected in any manner with the ownership, management, operation or control of any business similar to the type of business conducted by Employer, and will not conspire with others to do so. "Indirect Competition" shall be deemed to include any activity by Employee, in aid of a competing business, including but not limited to, being a shareholder, officer, director, agent, employee, advisor, consultant or independent contractor of any competing business.

b. **Restriction as to Territory.** Employee's agreement not to compete against Employer shall extend throughout the territory where it actually does business or may reasonably expect to do business and the territory where its customers are located.

c. **Restriction as to Duration.** The duration of this agreement not to compete shall extend throughout the term of Employee's employment with Employer and for an additional two (2) years thereafter; provided, however, that the duration of the foregoing covenant shall be extended beyond the time period set forth herein for a period equal to the duration of any breach or default of such covenant by Employee. Employee agrees that this restriction as to duration is reasonable in light of the nature of Employee's job and the fact that, among other things, it could take at least two years for Employer to adequately locate, train and establish a replacement for Employee.

d. **Independent Covenant.** Employee's agreement not to compete as set forth in this section 5.4 is understood to be an independent covenant and agreement on Employee's part which may be enforced against Employee regardless of any claim Employee may have or assert against Employer.

e. Court Ruling. In the event that the foregoing agreement not to compete is determined by a court of competent jurisdiction to be excessive in its duration or in the area to which it applies, it shall be considered modified and valid for such duration and for such area as said court may determine to be reasonable under the circumstances.

5.5 Copy to New Employer. Throughout the term of this Agreement, and for a period of two years thereafter, Employee will inform Employee's new or prospective employer, prior to accepting employment, of the existence of this Employment Agreement and will provide such employer a copy thereof.

5.6 Covenant Against solicitation. Employee agrees that Employee will not, for a period of two (2) years subsequent to the termination of Employee's services with Employer, directly or indirectly, either as an individual for his or her own account, or on behalf of another person or entity, solicit any present or future employee of Employer for any purpose of hiring or attempting to hire such employee.

5.7 Remedies. In the event that Employee shall violate any of the foregoing provisions of this Section 5, then Employer shall have the right to seek injunctive relief and any other remedy allowed to it in law or equity, and to collect from Employee reasonable attorney's fees and costs incurred in bringing such legal or equitable action or otherwise enforcing the terms and conditions of this agreement.

6.

Termination; Exit Interview.

6.1 The employment of Employee may be terminated by Employer without reason or cause upon the giving of two (2) weeks prior written notice to the Employee by certified mail or in person. Employee may terminate at will. Employer requests two (2) weeks notice. Employer shall have the right to terminate this employment immediately if Employee shall become insolvent or commit any act of bankruptcy, or make a general assignment for the benefit of creditors, or materially breach any provision of this Agreement or upon termination of Employer's business.

6.2 Employee agrees to participate in an exit interview at the time of termination of employment with Employer and will sign a statement that Employee has returned to Employer all documents and tangible property

pursuant to section 5.3 hereof and that Employee acknowledges his or her continuing obligations under this Employment Agreement.

Waiver of Breach. The waiver by either party hereto of the breach of any provision of this Agreement shall not operate or be construed as a waiver of any subsequent breach by any party.

8.

Assignment. This Agreement is personal to Employee, and Employee shall have no right to assign or transfer any of Employee's rights or to delegate any of Employee's duties under this Agreement.

9.

Miscellaneous.

9.1 This Agreement constitutes the entire agreement between the parties, superseding all negotiations, prior discussions, and preliminary agreements; provided, however, that any provisions regarding confidentiality, trade secrets, employee solicitation, agreements not to compete with Employer and similar covenants contained in any previous agreement between Employee and Employer shall remain in full force and effect. In the event of any conflict between such provisions in any previous employment agreement and this Agreement, the provisions of this Agreement shall govern.

9.2 Because various provisions of this Agreement are designed to have effect after the termination thereof, it is the intention of the parties that these provisions shall survive the termination thereof and continue to be effective and enforceable thereafter.

9.3 This Agreement shall be binding upon each party's heirs, assigns, successors and legal representatives.

9.4 This Agreement shall be construed and interpreted according to the laws of the State of Minnesota.

The parties have hereunto executed this Employment and Non-Competitive Agreement on the dates set forth below.

Dated: 10/3/05

EZ Gard Industries, Inc.
By: Day Per
Its: Controller

Dated: 10/3/05

Pat Th
Employee

ACKNOWLEDGMENT

I herewith acknowledge that I have had an adequate opportunity to read the foregoing Employment and Non-Competition Agreement, that I have had an adequate opportunity to discuss its meaning and content with others, that I understand its provisions and that I hereby acknowledge that on this date I received a copy of the foregoing Employment and Non-Competition Agreement.

Dated: 10/3/05

Pat Th
Employee



CLC 745988

UNITED STATES | ENGLAND | GERMANY | CHINA

KEVIN WAGNER
KWagner@faegre.com
(612) 766-6922

December 5, 2007

Clerk of Court
U.S. District Court
202 U.S. Courthouse
300 S. 4th Street
Minneapolis, MN 55415

Re: EZ Gard Industries, Inc. v. XO Athletic Co. and Paul J. Andre

Dear Clerk:

Enclosed for filing please find the following:

- Complaint, with attached exhibits;
- Summons;
- Civil Cover Sheet;
- Rule 7.1 Disclosure Statement of Plaintiff EZ Gard Industries, Inc.
- Motion for Temporary Restraining Order;
- Memorandum in Support of EZ Gard Industries, Inc.'s Motion for Temporary Restraining Order;
- Declaration of Steve Washburn, with attached exhibits;
- Declaration of Jay Turkbus;
- Declaration of Kevin Wagner, with attached exhibits; and
- Proposed Order.

Very truly yours,

FAEGRE & BENSON LLP

A handwritten signature in black ink, appearing to read "K.W." followed by a stylized surname.

Kevin Wagner

WAGKP:lysmm
Enclosures
fb.us.2460796.01